

## SEQUENCE LISTING

<110> PAPES, Fabio  
 GERHARDT, Isabel Rodrigues  
 ARRUDA, Paulo

<120> CAMBIUM/XYLEM-PREFERRED PROMOTERS AND USES THEREOF

<130> ALEL 202.1 PCT

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<150> US 60/560,227

<151> 2004-04-06

<160> 41

<170> PatentIn version 3.2

<200> SEQUENCE CHARACTERISTICS:

<210> SEQ ID NO 1

<211> LENGTH: 3035

<212> TYPE: DNA

<213> ORGANISM: Populus sp.

<220> FEATURE:

<221> NAME/KEY: promoter

<222> LOCATION: (1)...(3035)

<223> OTHER INFORMATION: Sucrose synthase (SUSY) promoter

<400> SEQUENCE: 1

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&lt;221&gt; NAME/KEY: promoter

&lt;222&gt; LOCATION: (1)...(2513)

&lt;223&gt; OTHER INFORMATION: alpha-tubulin (TUB) promoter

&lt;400&gt; SEQUENCE: 2

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&lt;212&gt; TYPE: DNA

&lt;213&gt; ORGANISM: Populus sp.

&lt;220&gt; FEATURE:

&lt;221&gt; NAME/KEY: promoter

&lt;222&gt; LOCATION: (1)...(2041)

&lt;223&gt; OTHER INFORMATION: Arabinogalactan protein (ARAB) promoter

&lt;400&gt; SEQUENCE: 3

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<220> FEATURE:

<221> NAME/KEY: promoter

<222> LOCATION: (1)...(2422)

<223> OTHER INFORMATION: Caffeic acid 3-O-methyltransferase (COMT) promoter

<400> SEQUENCE: 4

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<221> NAME/KEY: promoter  
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<223> OTHER INFORMATION: cinnamate 4-hydroxylase (C4H) promoter  
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<222> LOCATION: (1)...(1007)  
<223> OTHER INFORMATION: cinnamoyl CoA reductase (CCR) promoter  
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tacatccact ccaccatgto tttccttgta acatccactt ttcaagccaa gataagaaga aaagacatct 910
cctctcctct tctctctgt ctgttctcca ctttcccagt caccaaactc gtatacatat aattacattt 980
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## &lt;200&gt; SEQUENCE CHARACTERISTICS:

&lt;210&gt; SEQ ID NO 8

&lt;211&gt; LENGTH: 2081

&lt;212&gt; TYPE: DNA

&lt;213&gt; ORGANISM: Populus sp.

&lt;220&gt; FEATURE:

&lt;221&gt; NAME/KEY: promoter

&lt;222&gt; LOCATION: (1)...(2081)

&lt;223&gt; OTHER INFORMATION: ferulate-5-hydroxylase (F5H) promoter

&lt;400&gt; SEQUENCE: 8

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ttcagtgaac atgctgccac aatgacatat atatcatcac aaattaatta atgtctactt taatgetgat 70
atatcttttg tttattatit tttttcctat catgggaaat gagatcaact ttttcagatg aaaattacta 140
attaaactat catatttcca gtttaatcaa agatatggaa tctttatttc actaaagata ttattattca 210
taagaatttg atgagttctt gcattatttg ttagattatc ttcaacctct tgcaattagt gcttcatgga 280
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aatctccctt aagatataat aaattgaact gagatgcaat taagtcgggt aaaaggcctg gatactgcc 420
gtgaataaga tttacacaaa atattggatt ttttcccgto ctgaaagcta attattgtca gaaaaatacg 490
ttttgaaata gttgattttt attgatattg tggaataaaa acatcaatgg ttccaatgtc taaccacgaa 560
aatgacttgt aaaatttata ataaggtcta tttttttcat caagcaataa taataagggt aggcacaaa 630
atctctcact ttttgcttct gatcaaagat cactaagcag aacttgcag gaacctcatc tctctctctc 700
tccccctctc tctctctccc cctctccctc tctatatata tatatatata tatatatata tatgcaagta 770
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atattttatt taaaaatata ttaaaataat atatttttta tttttaaaaa tatattttta atatcaatac 1610
attaaaataa tttaaaatat aaaaatacaa aaatattttt taaccacaaa aaaaaaaac tatgaaaatt 1680
aatgttctta aatattgttc tccatccaga ttttggtacg tatgcgttcc cagtgtgtac ttgtttatga 1750
aagtctactc ttatttttca acttttctca agacattgaa ttagtaaaac aatgttttac gaattggata 1820
cgaaaccttc caaaataata tatatatata tatatatata tatatatata tatatatata tatatatata 1890

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tatatatata tatatatata aaga999agg gagggggtgg gggagggtcac aaaaaacctg tatataaagc 1960  
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 cacaatacaa tacataccat agacacaaac acaaaaatct gcatccatgg a 2081

## &lt;200&gt; SEQUENCE CHARACTERISTICS:

&lt;210&gt; SEQ ID NO 9

&lt;211&gt; LENGTH: 995

&lt;212&gt; TYPE: DNA

&lt;213&gt; ORGANISM: Populus sp.

&lt;220&gt; FEATURE:

&lt;221&gt; NAME/KEY: promoter

&lt;222&gt; LOCATION: (1)...(995)

&lt;223&gt; OTHER INFORMATION: sinapyl alcohol dehydrogenase (SAD) promoter

&lt;400&gt; SEQUENCE: 9

taatcgaaac cgatcgattt gaactggttt cttttttttt ttaatttttg tttggttgct tttttttgtc 70  
 acccctaata attatatata ataataaaa taaaattatt taccattatt tgtctgagat tttttttaat 140  
 agaatgatta aaatgatatt gtataaaaa cctaataata ccatactttt caaataatat tttttactat 210  
 tattagtgat tgggttgctg tcaaagttgt tttttttttt ttactattc ttaggagttt gtttctttta 280  
 ccctagtcta caggagtttg ttagttacta tcatctcttt aaaaaggaaa ctcatatgga aaaggaaaaa 350  
 ttgattaaat acaaaaaaatt ataaaattac atagagtttt tatttatttg aacgattgag tttaatttta 420  
 acttaataaa atataattaa ttacaggtaa aacaagtact tatcaatcat tataagtata ttataaaaca 490  
 tattaattat gagttcagca aagatttggt ctgatttctt gtctcttcta aactacatgt gacaagatag 560  
 aaaaaacatc taaatgctaa tgattcttta atatatgact atgcaagtca tttatcttat ttaatacat 630  
 taattttaat caaacttaat tttaaattat tggattctaa tataattgtg ttttaaaaca cttaggtagc 700  
 ttctctgttg gaccggaaac tggttcatga actgaaataa tctatgcgaa taacgttttc ccacaaaaag 770  
 aagaacgact tgctttttta gcgacaatca tgcctccttc gacctcacg atgacaccac ctgtgagtgc 840  
 tgtttgccag taacatcacc tccttgctcc tatgtgtata tagaaagaca aacttgccaa gcataaaaaa 910  
 gaagaagaag aagtcatact atatatctcc tgccttctct ctgcacgata tttctctatc tgaagcaagc 980  
 accatggtag atcta 995

## &lt;200&gt; SEQUENCE CHARACTERISTICS:

&lt;210&gt; SEQ ID NO 10

&lt;211&gt; LENGTH: 1269

&lt;212&gt; TYPE: DNA

&lt;213&gt; ORGANISM: Populus sp.

&lt;220&gt; FEATURE:

&lt;221&gt; NAME/KEY: promoter

&lt;222&gt; LOCATION: (1)...(1269)

&lt;223&gt; OTHER INFORMATION: UDP-D-glucuronate carboxy-lyase (UDP) promoter

&lt;400&gt; SEQUENCE: 10

ggaaatgtca acacttggtg gaccacacgc acactgtaga cgctacetta cctggccaga ccccgctgcc 70  
 cagggattac aatttaattt gaatttgata atatcatctc aactaacttg aatgaatatt ctttttttaa 140  
 cagttgtatt gcttcatgga aaataaatat tgtatatatt aggatattta atttgaaata aatattatca 210  
 aatatgactc aaaaccagc ctaatatatt tatattttga atatgataca atataaacct ttttagtatt 280  
 aacataatgc atgtgttgaa taaatatttt tttttattaa ataataaata tggattgaat gtcgaaaaga 350  
 gaaataaata gtgtactcat agttacccca tgtacaagtt gagtacaaca acagatgtag tcaaaataaa 420  
 agaaaactcg gtctgacgtg tcgttaccat tactgtcatt ggacagtaaa gtctttogac tgtaacagaa 490  
 catgttctcc ttctctctgg ccagtaacga ccgcgaatta cgcttctcga aaatttcaat ctaaccttga 560  
 acactatata agtatatgac ctgtctctca tcatccgctg tccttaaact ccttcaaaat actacaacaa 630  
 aatatttttt tccctcaatt tatttcagca gcaaaagtct acgtggtaat taaatctcaa tttccattcg 700  
 tttttatagg gatttttggg tgtctggaga aaaaaataat ggtcatggga ttgagagatt ttgagattca 770  
 gatctgaagt ttgtttttaa ttttttcaat aactgggtgg gtatgggttt tcgttgattt gaagcattgt 840  
 acatttcgtg tttttgaagt ctcatttaat ttatgcgtcc ctctttttct ctctcactag ctggtgttgt 910  
 ttggttggtg gtttattatc atgattagtt gtaaccatc tattttttta tctaatttgg ttacaatcga 980

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gttctttata taaagctgta gtctttgagt ttcattgactc gcagcgaaaa aagtttgaga ttttgactct 1050
atTTTTTcaC accactcagg tgaactggat ttattatcat gtttttaatt gaaacttggt ggctgggttg 1120
atTTaagggt tttgatttgt ggggtatttta tgaatgtgag gattatgcaa tgttttggtt ctgggttggt 1190
tttacaattt atgggtggatt gatttttttt ttttaatttc atgattttca gaaattggac aagaatgtca 1260
gatctgata 1269

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## &lt;200&gt; SEQUENCE CHARACTERISTICS:

&lt;210&gt; SEQ ID NO 11

&lt;211&gt; LENGTH: 1025

&lt;212&gt; TYPE: DNA

&lt;213&gt; ORGANISM: Populus sp.

&lt;220&gt; FEATURE:

&lt;221&gt; NAME/KEY: promoter

&lt;222&gt; LOCATION: (1)...(1025)

&lt;223&gt; OTHER INFORMATION: lipid transfer protein (LTP) promoter

&lt;400&gt; SEQUENCE: 11

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gaattcgatt acgatgaaat gaagaactga tagcataatc aatcagaaga ttgataatta ttcaaaataa 70
tttttcgaac aatattcaat gcatgatgat tataatgtcgg atcaataaat aatcaattta atgtaaaaaa 140
ggggtaactta agtaataaat aataataata ataataaatg ccttagcatc taaaattcgc tatttttaga 210
agaatcacat tccaagcttc atgaacaatc taatgttcaa tgacatttga tatttttaat aattcaagaa 280
tctcaacaat acaagaatca ttggcatcgc aagatatttt cctaagcaa gctctaaaat ccccgtaaa 350
aacatccttt aaggatatata tattagtctg aaaataatta tgtgttaatc ttcattgtgca gtggtgagta 420
tttcggccat tcaggcgggt gacccgggat cggtcccccag caacggcgctc agttttaatt tttatgtttt 490
cttgaaagtt ttcttaattc ttggcgctgg ctttttggtt ggaaggaaac cggtgttgctg aaaggtaatg 560
gccactaatt gggcaagata atggcatgct tgtgttgctg tagttggctc aaaggggagc tttgtggttg 630
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tttgcgctgt cattaaaatg gtaacatctg gatatatgca atggaatggg atgatatggc acccaaatca 770
ccaacctttg attggactgg aaagaactat aatttacaac actaattttc taaagccaag tgctgcaata 840
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atcttgacgt ataaaagctg tccataggag taggagcatt gcattcccat acagcaagaa aatcaatttg 980
ttcatatata tagttgagat acagaaatat ggaggctcca gatct 1025

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## &lt;200&gt; SEQUENCE CHARACTERISTICS:

&lt;210&gt; SEQ ID NO 12

&lt;211&gt; LENGTH: 2341

&lt;212&gt; TYPE: DNA

&lt;213&gt; ORGANISM: Populus sp.

&lt;220&gt; FEATURE:

&lt;221&gt; NAME/KEY: promoter

&lt;222&gt; LOCATION: (1)...(2341)

&lt;223&gt; OTHER INFORMATION: ag-13 (AG13) promoter

&lt;400&gt; SEQUENCE: 12

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gaattcgcat ccatcggtg agttcgcat gggttgatcc aagtgaaca tttccatacc cacaccccca 70
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agatagactt ccactggaac catgcagcat tctcccgta tgacctcatt actcagcttt ttctactggg 210
gtttctgttt caaccttctc ctctgtttca acaggcttct gttcttctt ttcttcttct tctttgggg 280
cttcgactgc aacctccgct tcttctgcg gtgcctcacc aggcctgta gtctctttag cctcctcgac 350
aacaggctct acgggtatat cgggtcctc ttttgtctcc tcaacaaccg gctctggtgt ttccttaggt 420
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cgaattttca aatatgaaca tccaogaatt aaagatcata attaatgag aggtgttgat cttgatgtac 840
attccatcag cataaaactt atcagagtta tatatataaa tataattaat gacttggag aagtaataga 910

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tgaaatctgt taaataaact tctcaagagg gagattaaat cattcttagt gaatgagtta cctcaacagt 980
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acgttggagt aattatcaca gaagaggatg aagaaattgc tttagattt tgatgcagag tactgatgaa 1120
cgagggtgga tttatataga gatgtagggg gctcactcga gcgaggagg gagtgagtga gagaagagag 1190
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gcatcatatt aagtcaagga atgtcagatc t
2341

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## &lt;200&gt; SEQUENCE CHARACTERISTICS:

&lt;210&gt; SEQ ID NO 13

&lt;211&gt; LENGTH: 31

&lt;212&gt; TYPE: DNA

&lt;213&gt; ORGANISM/SOURCE: synthetic

&lt;221&gt; NAME/KEY: primer/oligonucleotide

&lt;400&gt; SEQUENCE: 13

5'- GCCATAGCTC CTTAAGAGAA ACAGAAAGCA A -3'

## &lt;200&gt; SEQUENCE CHARACTERISTICS:

&lt;210&gt; SEQ ID NO 14

&lt;211&gt; LENGTH: 32

&lt;212&gt; TYPE: DNA

&lt;213&gt; ORGANISM/SOURCE: synthetic

&lt;221&gt; NAME/KEY: primer/oligonucleotide

&lt;400&gt; SEQUENCE: 14

5'- CAATATAGAA TCAATGAACA GCACTAGTTT GC -3'

## &lt;200&gt; SEQUENCE CHARACTERISTICS:

&lt;210&gt; SEQ ID NO 15

&lt;211&gt; LENGTH: 20

&lt;212&gt; TYPE: DNA

&lt;213&gt; ORGANISM/SOURCE: synthetic

&lt;221&gt; NAME/KEY: primer/oligonucleotide

&lt;400&gt; SEQUENCE: 15

5'- TCATGTCCTA TCCAACGGCG - 3'

## &lt;200&gt; SEQUENCE CHARACTERISTICS:

&lt;210&gt; SEQ ID NO 16

&lt;211&gt; LENGTH: 24

&lt;212&gt; TYPE: DNA

&lt;213&gt; ORGANISM/SOURCE: synthetic

&lt;221&gt; NAME/KEY: primer/oligonucleotide

&lt;400&gt; SEQUENCE: 16

5'- CTCATTTTCT CTCAAAGCTC AAAG -3'

## &lt;200&gt; SEQUENCE CHARACTERISTICS:

&lt;210&gt; SEQ ID NO 17

&lt;211&gt; LENGTH: 30

&lt;212&gt; TYPE: DNA

&lt;213&gt; ORGANISM/SOURCE: synthetic

<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 17  
5'- GACAACTAGT CTAAAGTTAA AACTTAGACC -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 18  
<211> LENGTH: 20  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 18  
5'- CCCTGGAGGT TGGGGTGAGT - 3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 19  
<211> LENGTH: 25  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 19  
5'- GCGTTCATCT ACAAACCCT CCTCC -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 20  
<211> LENGTH: 23  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 20  
5'- TTCATCCTTA TTTTTTGGG ATA -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 21  
<211> LENGTH: 20  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 21  
5'- CAAAGGATCA TGGAGTTGGA - 3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 22  
<211> LENGTH: 34  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 22  
5'- TATACTAATA TGACCTAATA ACTTAGAAGT GTGG -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 23  
<211> LENGTH: 22  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 23  
5'- CATCTTGATC AAGATTGAAT TC -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 24  
<211> LENGTH: 20  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 24  
5'- CATAATATCA AACTTAAGC - 3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 25  
<211> LENGTH: 33  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 25

5'- TGAATTGATG ACGTAGGAAA CATGATAAAC ATG -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 26  
<211> LENGTH: 28  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 26  
5'- CATTTTCTTG AAACAATGAG GCTAAGAG -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 27  
<211> LENGTH: 29  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 27  
5'- GACATGAGAA ACTAACGTTG CTTGAATTC -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 28  
<211> LENGTH: 33  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 28  
5'- CATAATATTG GAACTGGTTT CTTGTGTCAGA AAG -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 29  
<211> LENGTH: 25  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 29  
5'- GCGCTCGGGT TGTACCATA GTTTC -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 30  
<211> LENGTH: 26  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 30  
5'- CATGTTGTTA TATTTAGATA AATGTA -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 31  
<211> LENGTH: 29  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 31  
5'- TTCATCAAGC AATAATAATA AGGTGAGGC -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 32  
<211> LENGTH: 26  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 32  
5'- CATGGATGCA GATTTTGTG TTTGTG -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 33  
<211> LENGTH: 26  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 33  
5'- TTCAGTGAAC ATGCTGCCAC AATGAC - 3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 34  
<211> LENGTH: 26  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 34  
5'- AATCGAAACC GATCGATTG AACTGG -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 35  
<211> LENGTH: 21  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 35  
5'- CATGGTGCTT GCTTCAGATA G -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 36  
<211> LENGTH: 28  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 36  
5'- GGAAATGTCA AACTTGTGT GACCACAC -3'

<200> SEQUENCE CHARACTERISTICS:  
<210> SEQ ID NO 37  
<211> LENGTH: 23  
<212> TYPE: DNA  
<213> ORGANISM/SOURCE: synthetic  
<221> NAME/KEY: primer/oligonucleotide  
<400> SEQUENCE: 37  
5'- GACATCTTG TCCAATTCT GAA -3'

<200> SEQUENCE CHARACTERISTICS:  
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5'- GGAGCTCCA TATTCTGTA TCTC -3'

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